What is claimed is:

1.   A speech section detection apparatus comprising:

preprocessing means for removing noise contained in a speech signal;

signal-to-noise ratio improving means for improving the signal-to-noise ratio of said speech signal from which noise has been removed by said preprocessing means; and

speech section extracting signal generating means for generating a speech section extracting signal based on said speech signal whose signal-to-noise ratio has been improved by said signal-to-noise improving means.

2.   A speech section detection apparatus as claimed in claim 1, wherein said signal-to-noise ratio improving means is a short-time auto-correlation value calculating means for calculating a short-time auto-correlation value of said speech signal from which noise has been removed by said preprocessing means, in accordance with the equation

$$X_c = \frac{1}{J} \sum_{j=0}^{J} X_L(n - j) \times X_L(n - j - M)$$

where X_c = short-time auto-correlation value

X_L = low-pass filter output

n = sampling number

J = number of correlated samples

M = number of independent samples.

3.   A speech section detection apparatus as claimed in claim 1, wherein said preprocessing means comprises:

a high-pass filter for cutting off low-frequency noise contained in said speech signal; and

a low-pass filter for cutting off high-frequency noise contained in said speech signal.

4.   A speech section detection apparatus as claimed in claim 1, wherein said speech section extracting signal

generating means sets said speech section extracting signal open when the level of said speech signal whose signal-to-noise ratio has been improved by said signal-to-noise ratio improving means has continued to stay

5   above a predetermined threshold value for a predetermined length of time.

        5.   A speech section detection apparatus as claimed in claim 2, wherein said speech section extracting signal generating means sets said speech section extracting

10   signal open when the level of said short-time auto-correlation value calculated by said short-time auto-correlation value calculating means has continued to stay above a predetermined threshold value for a predetermined length of time.

15   6.   A speech section detection apparatus as claimed in claim 4 or 5, wherein said speech section extracting signal generating means includes threshold value setting means for setting as said threshold value the product between an average level of said speech signal when said

20   speech section extracting signal is in a closed state and a predetermined factor.

        7.   A speech section detection apparatus as claimed in claim 5, wherein said speech section extracting signal generating means includes:

25   root-mean-square value calculating means for calculating a root-mean-square value of said short-time auto-correlation value calculated by said short-time auto-correlation value calculating means;

                  smoothing means for smoothing the root-

30   mean-square value of said short-time auto-correlation value, calculated by said root-mean-square value calculating means; and

                  threshold value setting means for setting, as said threshold value, the product between the root-

35   mean-square value of said short-time auto-correlation value smoothed by said smoothing means when said speech section extracting signal is in a closed state and a

predetermined factor.

8.   A speech section detection apparatus as claimed in claim 2, wherein said speech section extracting signal generating means comprises:

5   extracting signal opening means for setting said extracting signal open when said short-time auto-correlation value calculated by said short-time auto-correlation value calculating means has continued to stay above a predetermined threshold value for a

10   predetermined length of time; and

          extracting signal retroactively opening means for outputting said speech section extracting signal by setting said extracting signal open retroactively over a predetermined period when said

15   extracting signal has been set open by said extracting signal opening means.

9.   A speech section detection apparatus as claimed in claim 2, wherein said speech section extracting signal generating means comprises:

20   extracting signal opening means for setting said extracting signal open when said short-time auto-correlation value calculated by said short-time auto-correlation value calculating means has continued to stay above a predetermined threshold value for a

25   predetermined length of time; and

          extracting signal open state maintaining means for outputting said speech section extracting signal by maintaining said extracting signal in an open state for a predetermined period, even after said

30   extracting signal is closed, when said extracting signal has been set open by said extracting signal opening means.

10.   A speech section detection apparatus as claimed in claim 2, wherein said speech section extracting signal

35   generating means comprises:

          extracting signal opening means for setting said extracting signal open when said short-time

auto-correlation value calculated by said short-time auto-correlation value calculating means has continued to stay above a predetermined threshold value for a predetermined length of time;

5   extracting signal retroactively opening means for setting said extracting signal open retroactively over a predetermined period when said extracting signal has been set open by said extracting signal opening means; and

10   extracting signal open state maintaining means for outputting said speech section extracting signal by maintaining said extracting signal in an open state for a predetermined period, even after said retroactively opened extracting signal is closed, when

15   said extracting signal has been set open retroactively by said retroactively opening means.